UNITED STATES PATENT OFFICE.

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PROCESS OF DRYING GLUE OR GELATIN.

1,047,165. Specification of Letters Patent. Patented Dec. 17, 1912.

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To all whom it may concern:

Be it known that I, CHARLES H. CAMPBELL, of Chicago, in the county of Cook and State of Illinois, a citizen of the United States, have invented a new and useful Process of Drying Glue or Gelatin, of which the following is a full, clear, and exact description.

My invention relates to a process for drying glue or gelatin, these terms being hereinafter used under the common name of gelatin.

The drying of gelatin has in the past presented great difficulty to those skilled in the art for while the gelatin could readily be dried, yet to dry the gelatin and retain its jelly strength has been a problem to which those skilled in the art have devoted a great deal of time. The very nature of the substance precludes rapid drying when subjected to ordinary atmospheric conditions. For purposes of expediency, therefore, recourse has been had to forced or artificial methods of drying. Past effort and experience have demonstrated, however, that in the artificial drying of the gelatin, especially if this drying be carried on at a high or excessive degree of temperature, the jelly strength of the gelatin is apt to be very much lessened for commercial purposes, especially when the gelatin is used for purposes of an adhesive. It has accordingly been a common practice to dry gelatin, especially in the making of glue, by placing thin sheets of a jellied solution thereof on frames in a drying room or alley heated by currents of hot air admitted to the alley. Even under these conditions the jelly is very apt to develop mold or to liquefy through the action of bacteria, while if the temperature rises too high it is liable to melt. In summer it is nearly impossible to dry the sheets according to this method on account of the heat and moisture in the air. The method also is a protracted one, taking some twenty to thirty-six hours.

I am aware that the attempt has been made to dry gelatin by what is termed "roller drying in vacuum". In other words, a steam-heated roll has been arranged to dip into a liquid solution of the gelatin and when turned to take up the gelatin upon the peripheral surface of the roll, the same steam-heated surface of the roll acting to dry the gelatin, the operation being carried on in a chamber in which a partial vacuum is maintained. While it has been found that gelatin may be dried in this way and in a very short time, yet from the standpoint of utility such drying is not a success for the following reasons:

In the first place, the steam-heated roll will not pick up the gelatin solution in a film of uniform thickness. In so far as I am aware the reason for this is unknown. Consequently if the attempt is made to dry the thicker portions of the film the thinner portions thereof are overdried and the jelly strength impaired, or vice versa, if the thinner portions of the film are properly dried the thicker portions are not dried, and it is extremely difficult to remove the same from the roll, this being accomplished by a knife or blade.

Another serious difficulty in the use of a steam-heated roll is that of the formation of bubbles in the film. These bubbles are formed on account of the rapid expulsion of the water in the film or the water expanding in the form of vapor. The difficulty with these bubbles is that the exterior or skin of the bubbles does not become dry with the body of the film. From a series of experiments I find that few bubbles form upon the application to the roll of three to five pounds steam pressure; from five pounds steam pressure up to about twenty pounds steam pressure the bubbles increase in ascending ratio. I also find upon an application of about thirty-five pounds steam pressure or above that, while bubbles form, yet the extreme heat causes the vapor or steam inside the bubble to expand sufficiently to break it, so that before the bubble reaches the knife that portion of the film forming the bubble has broken, shrunk up and dried. Such high degree of heat, however, is prohibitive owing to the fact of its being so injurious to the jelly strength of the gelatin.

A further trouble with the steam-heated roll is that the jelly strength of the gelatin is impaired even at the lower degrees of steam pressure on account of the heat necessarily induced in the roll. Besides, the feed liquor will sometimes not adhere to the roll in spots.

I have found a way or process by which the difficulties above recited are overcome, the gelatin being rapidly dried; subjected during the drying to no injurious heat in-

fluence, the practical elimination of bubbles; the application to the roll of a film of uniform thickness which becomes uniformly dried, the process resulting in not only a greater output of dried product in a given time than has ever before been accomplished in so far as I am aware, but also producing a dried product having a higher jelly strength than can be secured by the present methods in the so-called drying alley, on which account the process is exceedingly valuable in the drying of glue gelatin.

According to my process the solution of gelatin to be dried is run into a tank into which a large roll dips by which the solution may be taken up onto the peripheral surface of the roll as it is turned. I prefer to employ a roll of about five feet in diameter. The roll is heated for drying the gelatin taken up by it by the introduction of hot water into the interior of the roll. This in practice is accomplished by a pipe connecting with the roll at the point of its axis or one of its trunnions and having an outlet at the point of the other trunnion.

For drying the gelatin the water is maintained within the roll at a temperature of less than 212° F., a temperature of approximately 180° F. being preferably maintained, for with this temperature I have found that I obtain the best results. In practice to maintain the temperature I keep the water continuously in circulation and the roll entirely full.

The operation of drying above described is preferably carried on in a chamber in which a partial vacuum is maintained.

The density of the liquid solution of gelatin in the tank or feed liquor is preferably such that a rather thick film of the solution will be taken up by the roll. In practice I prefer the feed liquor to carry about twenty-five per cent. gelatin solids.

Of course in so far as the present process is concerned the manner in which the gelatin solution to be dried is applied to the roll is immaterial for the essential point of the process resides in the mode of drying the solution. The most practical method of applying the gelatin solution to the roll is by arranging the roll to dip in part into the solution as described above although other expedients are sometimes resorted to.

Claims:

1. The process of drying gelatin consisting in applying the gelatin solution to be dried to the surface of a revolving heated roll and heating said roll by hot water introduced into the interior thereof and maintained therein at a temperature of less than 212 degrees Fahrenheit.

2. The process of drying gelatin consisting in applying the gelatin solution to be dried to the surface of a revolving heated roll and heating said roll by hot water introduced into the interior thereof and maintained therein at a temperature of approximately 180 degrees Fahrenheit.

3. The process of drying gelatin consisting in applying the gelatin solution to be dried to the surface of a heated roll revolving in vacuum and heating said roll by hot water introduced into the interior thereof and maintained therein at a temperature less than 212 degrees Fahrenheit.

4. The process of drying gelatin consisting in applying the gelatin solution to be dried to the surface of a revolving heated roll and heating said roll by hot water introduced to circulate through said roll kept full at a temperature of less than 212 degrees Fahrenheit.

CHARLES H. CAMPBELL.

Witnesses:

JOHN E. R. HAYES,

JAMES J. KENNEALLY.